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IPCC: FIFTH REPORT

THE Intergovernmental Panel on Climate Change (IPCC) launched the first part of its latest report in Stockholm on 27 September. The report's summary for policymakers contained 19 headline statements relating to past, present and future climate and offered the clearest assessment yet on the changes likely this century.

Around 70 scientists from the IGBP community are contributing to the IPCC's Fifth Assessment Report. Global Carbon Project Chair Corinne Le Quéré took part in the tense discussions between scientists and national representatives, which ran night and day to finish on time. IGBP also joined the five-day meeting as an official

observer of the process.

In a first for IPCC, a major public forum took place the day after negotiations ended to discuss the report. Organised by IGBP, the forum attracted an audience of 480 people to Stockholm's Kulturhuset, with 4744 viewers joining the livestream online. Thomas Stocker, IPCC Working Group I Co-chair, joined Markku Rummukainen and Deliang Chen, two IPCC authors from the universities of Lund and Gothenberg (Sweden), plus IGBP Executive Director Sybil Seitzinger. The event was co-sponsored by a range of Swedish organisations and funded by the UN Foundation and Swedish funding agency Formas.

UNEP report on Sustainable Development Goals

A NEW report recommends that the proposed UN Sustainable Development Goals (SDGs) better integrate environmental goals and targets than the Millennium Development Goals. The discussion paper, "Embedding the environment in Sustainable Development Goals", was published by the United Nations Environment Programme (UNEP) in August.

UNEP's Chief Scientist Joseph Alcamo hopes the document

will feed into the international talks on SDGs. The process is a result of several roundtable meetings organised by UNEP and involved many experts, including IGBP's Executive Director Sybil Seitzinger.

Led by Alcamo, the authors proposed six criteria for embedding environmental sustainability in SDGs, including focusing on environmental issues with strong links to socio-economic developmental issues and giving priority to critical "irreversible" environmental changes. The report advises

policymakers to build goals and targets that are scientifically credible and verifiable and concludes all goals need specific and measurable targets and indicators.

While the report covers data and reporting issues, it stops short of identifying environmental priorities. More meetings are planned in the coming months to hammer out these main concerns. Contact Sybil Seitzinger for more information.

Writing from Bangkok

THE Asia-Pacific Network for Global Change Research funded a "Write a Paper" workshop as part of the IGBP synthesis led by Pauline Dube in Bangkok at the end of August. The aim of the workshop was to improve research-writing skills of academics from nations such as Bangladesh and Cambodia, to increase success rates for submissions to peer-reviewed journals.



Franz Dejon

DIVERSITAS transitions

ANNE-HELENE Prieur-Richard will serve as the Acting Executive Director of DIVERSITAS during the programme's transition to Future Earth. The former Deputy Director stepped in for Anne Larigauderie, who is now Head of Science in Society at the International Council for Science (ICSU).

See diversitas-international.org.

Director appointed

Frans Berkhout, a professor of Environment, Society and Climate in the Department of Geography, King's College London, became Interim Director of Future Earth last July. Former Director of the Amsterdam Global Change Institute, Berkhout will serve at the new programme's temporary Paris offices through the transition period, until the permanent Secretariat is up and running in 2015. He is a lead author on the Intergovernmental Panel on Climate Change Fifth Assessment Report.

Scientific committee named

Former IGBP Vice-chair Mark Stafford Smith has been appointed Chair of Future Earth. His Vice-chairs will be Belinda Reyers from South Africa and Melissa Leach from the UK. Many past and present members of IGBP committees are also represented, including Cheikh Mbow, Eduardo Brondizio, Sandra Diaz, Corinne Le Quéré and Dahe Qin. Future Earth's first scientific committee meeting is in South Africa, 19-21 November.

Secretariat bids

The alliance of partners developing Future Earth received 22 expressions of interest from countries keen to host the secretariat or a regional node.

Blog launched

In July, Future Earth launched a blog with articles and opinions focused on global sustainability. The blog features video interviews with, for example, Richard Wilkinson, the author of best-seller *The Spirit Level*, and Melissa Leach, Future Earth's Vice-chair. See futureearth.info.



Website for IHOPE

THE Integrated History and future of People on Earth (IHOPE) initiative launched a new website this summer, <http://ihopenet.org/>. The fruits of the project can be viewed there, as well as in the pages of this issue (see features: AIMES 2.0, p. 10; PAGES 2k, p. 18; and Maya modelling, p. 28).



Australian rains halted sea-level rise

THE world's sea level has been rising by about 3 mm every year for several decades – but not during an 18-month period across 2010 and 2011. Global sea level reversed, falling 7 mm.

A team of researchers led by John Fasullo of the US National Center for Atmospheric Research in Boulder, Colorado, figured out why (*Geophysical Research Letters*, doi:10.1002/grl.50834). A combination of two climate patterns, La Niña and the Southern Annual Mode, led to record-breaking heavy rains and flooding in Australia.

The amount of water that sank into the soils of the Australian Outback or evaporated back into the air was enough to make a difference in global sea level. Since 2011, sea level is back on the rise and is accelerating.

ANTHROPOCENE GOES MAINSTREAM

WRITERS of some recent apocalyptic thrillers and Hollywood movies have been turning to Earth-system science for inspiration. Perhaps it's time to coin a new term for an emerging breed of fiction – “Anthro-fi” – that tackles the wider implications of living in the Anthropocene.

Last May saw the release of the summer blockbuster *After Earth* starring Will Smith. The film follows a father and son returning to Earth a millennium after humanity somehow abandoned it following widespread ecological collapse caused by humans.

After Earth's producers took a novel approach to outreach. They commissioned scientist and educator Joseph Levine to create a website to accompany the film. The site explores the science behind global change and large-scale ecological challenges facing humanity. Visitors can learn about the Anthropocene and the Earth system. They also get an introduction to planetary boundaries and planetary stewardship, concepts meant to help avoid the film's unlikely premise altogether.

IGBP worked with Levine to develop content, which also features input from NASA and the National Oceanic and Atmospheric Administration (NOAA). The website includes a short data visualisation co-produced by IGBP on the Anthropocene, as well as the recent commentary in the journal *Nature* on “Sustainable development goals for people and planet”, co-authored by several IGBP community members, including Priya Shyamsundar of the scientific committee.

Also in May, Dan Brown, author of the bestseller *The Da Vinci Code*, published his latest novel, *Inferno*. Brown included IGBP's graphs of the “Great Acceleration” published in the first IGBP synthesis (Steffen *et al.* 2004). The concept of the Great Acceleration – 24 graphs showing exponential growth in socio-economic and Earth-system indicators – is central to the plot of this fast-paced thriller about an unhinged geneticist bent on solving the global population “problem” alone.

Inferno and *After Earth* have been associated with a genre of fiction known

as “cli-fi” for “climate fiction”. The term is used to pigeonhole books and films such as *The Day After Tomorrow* (2004) and Ian McEwan's novel *Solar* (2010) that tackle climate and related issues.

But these more recent examples are broader than climate. In their own unique ways, both *After Earth* and *Inferno* explore how decisions or actions made now may have immediate global repercussions that are irreversible on millennial timescales.

It seems there's a cultural awakening around the idea of the Anthropocene. Several well-known journalists have announced they are writing Anthropocene-themed books, including David Biello of *Scientific American* and British freelancer Gaia Vince. In September, Margaret Atwood published *MaddAddam*, the third part of her “dystopian” and “speculative fiction” trilogy (which started with *Oryx and Crake* in 2003). The novel finishes a tale of vigilante population “interventions” by a scientist and his team, to fix what he sees as the world's socio-economic problems.



Q&A WITH FUTURE EARTH'S SCIENCE COMMITTEE CHAIR

Mark Stafford Smith is the Science Director of CSIRO's Climate Adaptation Flagship based in Canberra, Australia, and former Vice-chair of IGBP. He recently spoke with Johannes Mengel, Web Editor for the International Council for Science (ICSU). A condensed version of their conversation follows (read the full Q&A at Future Earth's blog, futureearth.info).

Q: Tell us a little about yourself. What is your background and research?

Mark Stafford Smith [MSS]: I started out as a systems ecologist with a focus on drylands, and spent a long time based in Alice Springs in Australia, first working on arid zone ecology and then looking at people's decision-making, interactions between pastoral production and conservation, and finally trying to understand how regional economies work in remote areas. At the same time, I was involved with IGBP, initially as part of its old Global Change and Terrestrial Ecosystems Project, but later as a member of the IGBP Scientific Committee.

Q: You were Co-chair of the Planet Under Pressure conference in March 2012, along with UNESCO's Lidia Brito. What did the conference achieve?

MSS: What was amazing about the conference was seeing such diversity of skills and perspectives coming together in the one place, trying out all sorts of novel ways of interacting. Assembling the research community for conferences like this should be one of the regular but not too frequent things that Future Earth does.

Q: What is your vision for Future Earth?

MSS: Future Earth has an expansive potential agenda, but we also need to focus. One way of thinking about this would be to use the three research themes as a lens for understanding our stakeholder needs.

I see the main role of the first theme as really continuing the important existing work of the projects, albeit perhaps with new focus. The second and third research themes open up new opportunities that some of the projects have started pushing into, such as global development, which could in part support sustainable development goals, and the transition into a different type of economy.

Q: How far beyond the current global environmental change programmes will Future Earth go?

MSS: Future Earth has to maintain continuity with the existing global change work while opening the door to new opportunities. In doing so, Future Earth should seek expertise from new communities such as economics, engineering, history and the arts.

Another top priority is stronger engagement with decision makers who use our work. That's not to say that there shouldn't be some basic research. But a lot more of our research needs to be clearly user-inspired and solutions-oriented. Somewhere in Future Earth we need that true, fundamental engagement which helps tell us what knowledge is really going to be useful in the next five to ten years.

Q: What are the priorities in the first year?

MSS: The immediate priority for Future Earth is to ensure that there is continuity for the existing projects. We need to design the modus operandi by which the projects move into Future Earth, while keeping our options open in terms of new activities and new communities. All the while, we have to live and breathe the intention to engage with decision-makers. We have to ensure that that engagement is there from the start.



Photo: courtesy of ICSU

EVENTS

2013

November

5-8. IGBP Officers meeting. Gaborone and Maun, Botswana

11-22. IPCC COP19. Warsaw, Poland

18-22. 6th International Nitrogen Conference. Kampala, Uganda

19-21. Future Earth Science Committee. Gauteng, South Africa

December

1-4. IGFA/Belmont Forum meeting. Cape Town, South Africa

9-13. American Geophysical Union Fall Meeting. San Francisco, USA

2014

January

20-21. Future Earth projects meeting. Washington DC, USA

March

19-21. Global Land Project: 2014 Open Science Meeting. Berlin, Germany

April

7-11. IGBP Scientific Committee meeting. Bangalore, India

7-12. Arctic Science Summit Week. Helsinki, Finland

May

12-16. 4th iLEAPS Science Conference. Nanjing, China

12-16. Adaptation Futures 2014. Fortaleza, Brazil

June

23-27. IMBER Open Science Conference. Bergen, Norway

September

22-26. 13th IGAC Open Science Conference. Natal, Brazil

IGBP Scientific Committee Meeting

THE IGBP's 28th Scientific Committee meeting was held in Bern, Switzerland, 16–19 April. The three-day meeting tackled IGBP's twin priorities: the transition to the new Future Earth initiative and the development of IGBP's second synthesis.

The main outcome from the meeting was the decision to complete the transition of IGBP's projects to Future Earth by December 2015, as IGBP comes to a close at this time. James Syvitski, IGBP Chair, proposed an event in 2015 to mark almost three decades of the programme.

The meeting also discussed

IGBP's second and final synthesis which will be conducted in three parts: first, high-level papers will explore the integrated natural and social science perspective of the challenges of the Anthropocene, in collaboration with IHDP. Second will be an analysis of how the discipline of Earth-system science has developed in the context of its contribution to global sustainability. And, finally, a series of papers from IGBP's core-projects will synthesise project findings, to inform the projects' future visions as they transition into Future Earth.

The meeting was organised by the Past Global Changes project, and coincided with

the annual Swiss Global Change Day, a one-day symposium highlighting the latest research in Earth-system science organised by ProClim, IGBP's Swiss national committee. James Syvitski and Sybil Seitzinger both spoke at the packed event.

IGBP Synthesis Committees*

Core projects

Paul Monks (Chair)
Cheikh Mbow
Ramesh Ramchandran
Megan Melamed
Giovana Mira de Espindola
Sybil Seitzinger

Anthropocene

Eduardo Brondizio (Co-chair)
James Syvitski (Co-chair)

John Dearing
Peter Verburg
Priya Shyamsundar
Patricia Matrai
Frank Biermann
Arthur Chen
Karen Seto
Amy Dahan-Dalmedico
Sybil Seitzinger
Ninad Bondre

Earth-system science

Jan Willem Erisman (Chair)
Martin Claussen
Jose Marengo
Guy Brasseur
Mitsuo Uemastu
Christiane Lancelot
Thorsten Kiefer
Philippe Ciais
Sybil Seitzinger

* Subject to change

LIMITS TO (PHYTOPLANKTON) GROWTH

HUMANS are upsetting the balance of nutrients in the ocean, with agricultural runoff and other sources. For example, atmospheric deposition of "fixed" nitrogen to the open ocean has tripled since 1860, and will probably increase another 10–20% by 2050.

Understanding how these nutrient levels are changing and how this will affect biogeochemical cycles in the future is important. Nutrients such as nitrogen, iron and phosphorus limit the abundance

of phytoplankton, the tiny single-celled ocean organisms that photosynthesise and play a crucial role in the carbon cycle.

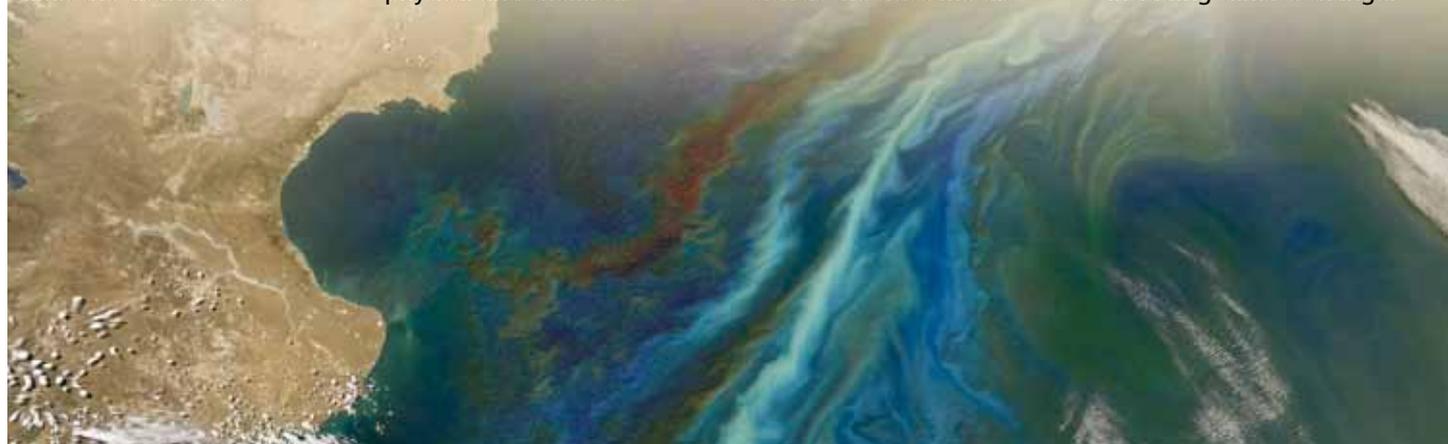
Christopher Mark Moore of the University of Southampton (UK) and his colleagues recently published a comprehensive review in *Nature Geoscience* (*Insight – Marine cycles in flux*, doi:10.1038/ngeo1765) on "processes and patterns" of nutrient limitations in the ocean. They included physical and chemical

processes in their assessment of biological patterns. The analysis stemmed from a workshop from IGBP's Fast Track Initiative on Upper Ocean Nutrient Limitation.

While nitrogen is the primary limiting nutrient in many places in the oceans, iron is limiting at high latitudes and upwelling areas, such as off the coast of South America in the Humboldt system. (In some places, nitrogen and phosphorus co-limit productivity.) Micronutrients, such as the trace metals

zinc and cobalt or vitamin B₁₂, can have secondary effects in different regions of the oceans. For example, several tests showed cobalt being a secondary limiting nutrient after iron in the relatively nitrate- and phosphate-rich surface waters south of Alaska.

By pulling all of these complex interactions together, the authors have painted a useful overall picture based on decades of research, with a new view of future implications, including climate change.



NASA/Norman Kuring